CLAIMS

What is claimed is:

1. A semiconductor phototransistor comprising:

a substrate;

an appropriately doped collector formed on the substrate, which is formed with a collector electrode thereon;

an appropriately doped base formed on the collector, which has a different doping type from the collector and is formed with a base electrode thereon;

an appropriately doped emitter formed on the base, which has the same doping type as the collector and is formed with an emitter electrode; and

an appropriately doped sidewall, which has the same doping type as the base, has a transverse position roughly on the edge of the collector, a longitudinal position roughly under the base and on the same plane as the collector, and is formed with a sidewall contact so that holes accumulated at the base-emitter junction can be removed through the sidewall when the sidewall contact is connected with a lowest voltage.

2. The semiconductor phototransistor of claim 1, wherein the substrate is selected from a semiconductor substrate which is appropriately doped or semi-insulating.

3. The semiconductor phototransistor of claim 1 further comprising an appropriately doped sub-collector formed on the substrate, with a different doping type from the substrate.

4. The semiconductor phototransistor of claim 1, wherein the bandgap energy of the emitter is greater than or equal to that of the base.

5. The semiconductor phototransistor of claim 1, wherein there is a plurality of the sidewalls distributed on both sides and around the emitter.

6. The semiconductor phototransistor of claim 1, wherein the collector further contains a quantum structure grown on the collector using different materials alternately.

7. The semiconductor phototransistor of claim 6, wherein the quantum structure is a quantum well.

8. The semiconductor phototransistor of claim 6, wherein the quantum structure is a super-lattice.

9. The semiconductor phototransistor of claim 6, wherein the quantum structure is quantum dots.

10. A semiconductor phototransistor comprising:

a substrate;

an appropriately doped collector formed on the substrate, which is formed with a collector electrode thereon;

an appropriately doped base formed on the collector, which has a different doping type from the collector and is formed with two base electrodes thereon;

an appropriately doped emitter formed on the base, which has the same doping type as the collector and is formed with an emitter electrode; and

an appropriately doped sidewall, which has the same doping type as the base, has a transverse position roughly on the edge of the collector, a longitudinal position roughly under the base and on the same plane as the collector, and is formed with a sidewall contact so that holes accumulated at the base-emitter junction can be removed through the sidewall when the sidewall contact is

connected with a lowest voltage.

11. The semiconductor phototransistor of claim 10, wherein the substrate is selected from a semiconductor substrate which is appropriately doped or semi-insulating.

12. The semiconductor phototransistor of claim 10 further comprising an appropriately doped sub-collector formed on the substrate, with a different doping from the collector.

13. The semiconductor phototransistor of claim 10, wherein there is a plurality of the sidewalls distributed on both sides and around the emitter.

14. The semiconductor phototransistor of claim 10, wherein the collector further contains a quantum structure grown on the collector using different materials alternately.

15. The semiconductor phototransistor of claim 14, wherein the quantum structure is a quantum well.

16. The semiconductor phototransistor of claim 14, wherein the quantum structure is a super-lattice.

17. The semiconductor phototransistor of claim 14, wherein the quantum structure is quantum dots.